

History of *Aedes aegypti* Eradication in the Americas*

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The paper presented by Dr F. L. Soper earlier in this number covers most of the historical background of yellow fever. The campaign against its vector, *Aedes aegypti*, is a corollary of the work done in the past.

Today, with the elimination of *A. aegypti* from most of Latin America, the dangers of urban yellow fever are so reduced that primary attention can be given to the eradication of *A. aegypti* from the countries that are still infested. With the amount of work completed and the vast area from which *A. aegypti* has been cleared, it is mandatory to proceed until continental eradication has been achieved.

Finlay, in 1881, in Havana, presented the *Stegomyia* mosquito as "fly vector" of yellow fever. Reed and collaborators in the American Commission in 1900 made experiments that confirmed this fact scientifically. Based on this development, the elimination of *A. aegypti* in the fight against yellow fever was undertaken, first by Gorgas in 1901 in Havana, and later in Panama. These programmes were followed by similar campaigns by Joseph White in Havana, Oswaldo Cruz in Rio de Janeiro and Emilio Ribas in Santos. Yellow fever ceased to have an alarmingly high incidence, and several years of apathy followed.

This apathy ended in 1928 when an epidemic of yellow fever occurred in Rio de Janeiro, where the *A. aegypti* index was found to be high. With the renewal of interest, the anti-vector campaign spread over the country. After a few years, it was discovered that many large cities were negative and, in the early 1930s, eradication of *A. aegypti* began to be the aim in Brazil.

The eradication of *Anopheles gambiae* in North-East Brazil, initiated by the staff of the Yellow Fever National Service and achieved in 1942, was a contributory factor to the decision of the Brazilian Government officially to declare its intention to eradicate *A. aegypti* from the entire country.

At the Twelfth Pan American Conference, Brazil proposed that the American continent should undertake an eradication campaign, and this was unanimously approved by the member countries. The Pan American Sanitary Bureau was given the responsibility of co-ordinating and guiding the effort. This extended programme was a natural sequel to the realization in Brazil that eradication campaigns cannot be restricted by the boundaries of any one country.

The details of the results will be discussed briefly. *A. aegypti* is still present in the Caribbean area north-east of South America and in the south-eastern part of the USA. In continental Latin America, eradication has been achieved in most countries; only Venezuela remains positive. In Central America, El Salvador, after several years of negativity, was recently found to have become reinfested.

How was eradication achieved? In 1942, when the concept of eradication was stated, the classical methods of inspection of containers and oiling of breeding-places were applied. In 1946, with the advent of DDT, the mosquitos were shown to be highly susceptible to the insecticide, and the so-called "perifocal" method was instituted, starting in the north-east of Brazil. An emulsion formulation was used, and practically one application was sufficient for obtaining negativity in most of the areas of Brazil. The infestations were mostly rural, and most of the breeding was found to occur in earthenware jars. In north-eastern Brazil, where water is scarce, every house had 5 to 10 jars, each usually of 10-US-gallon (37-litre) capacity. The containers were treated, inside and outside, along with the walls nearby. When wettable powder formulations became available, they began to replace the emulsions, which were objectionable because of the smell and taste of the xylene solvent. Most of the work in Latin America was done with the perifocal method, using a 5% suspension of DDT water-dispersible powder.

In some cases, there was co-ordination with anti-malaria campaigns. The public health authorities

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checked the mosquito infestation in the areas treated during the antimalaria campaigns and took action whenever positivity was found. Specific work on *A. aegypti* was also performed in areas not covered by the antimalaria campaigns. Complete negativity was attained in this way, for example, in Mexico.

Mention should be made of the fact that, in the beginning, some work was done using the so-called focal method, by which drops of insecticide are put in water; this method, however, was not efficient.

In most of the countries involved, *A. aegypti* was found to breed chiefly in drinking-water containers. The perifocal method was used to treat containers with concentrations of insecticides that were not deleterious to human beings. Negativity was obtained without any harmful effects to animals or human beings.

The present problems include, first, the resistance of *A. aegypti* to the insecticides in use. Resistance was initially found in Trinidad in 1955. This Trinidad population of *A. aegypti* appeared to be resistant only to DDT, and negativity was obtained using treatments with dieldrin. However, at present, all areas of the Caribbean, both island and main-

land, have *A. aegypti* populations that are resistant to chlorinated hydrocarbon insecticides, including DDT and dieldrin. From French Guiana to the Bahamas, the situation is uniform in regard to this resistance. Malathion would be an alternative, but its use in drinking-water is difficult.

When considering the application of the classical methods (oiling), which were so successful in Brazil in the Caribbean, where the temperature is at a stable 80°F (27°C), the short retreatment cycle and the cost of manpower represent important problems. Research is necessary to provide new insecticides that will be both effective and long-lasting.

There is also a problem of reinfestation. In the Caribbean, where there is such an inter-connexion by boats of all sorts among the islands, the area must be considered as a whole. *A. aegypti* has been found in boats in the adult, larval and egg stages. Islands that were negative three to four years ago are now completely reinfested with resistant strains. There is hope that co-ordinated action will be taken to prevent reinfestation of countries that are still negative and to eradicate *A. aegypti* from its last stronghold in the Americas—the Caribbean.
